

Air Quality Implications of Ozone in Air Entering the West Coast of North America

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Ozone measurements conducted by the Global Monitoring Division at Trinidad Head, California provide a unique opportunity to evaluate the impact that background ozone transported ashore has on air quality over the North American continent. The northern Sacramento Valley lies ≈ 160 km inland from Trinidad Head. This valley is designated as a non-attainment area for the California state ozone standard, and the observed maximum mixing ratios indicate that the area will also violate the new 75 ppbv National Ambient Air Quality Standard (NAAQS). Figure 1 shows that the summertime surface air flowing ashore from the Pacific Ocean carries average ozone mixing ratios of ≈ 30 ppbv, which are well below the NAAQS. However, in summer (the season of the highest ozone in inland areas) there is a strong vertical gradient in ozone. The average ozone at 2 km altitude exceeds 50 ppbv, and one standard deviation above the average exceeds 70 ppbv. Thus, if air from 2 km altitude were mixed to the surface of the northern Sacramento Valley, the transported background ozone would significantly affect the surface ozone. The coastal mountain range separates the valley from the marine environment and its crest is at elevations of ≥ 1 km, so such mixing is expected. We will use correlations between the Trinidad Head sonde data and northern Sacramento Valley surface site data to show that such downward mixing does indeed occur, and we will argue that background ozone alone is sufficient for NAAQS violations. If correct, the implications of this conclusion are profound. Local or state efforts will not be adequate to achieve the NAAQS for ozone, at least in the northern Sacramento Valley. Additional international efforts to reduce background ozone at northern mid-latitudes will be required for effective control of violations.

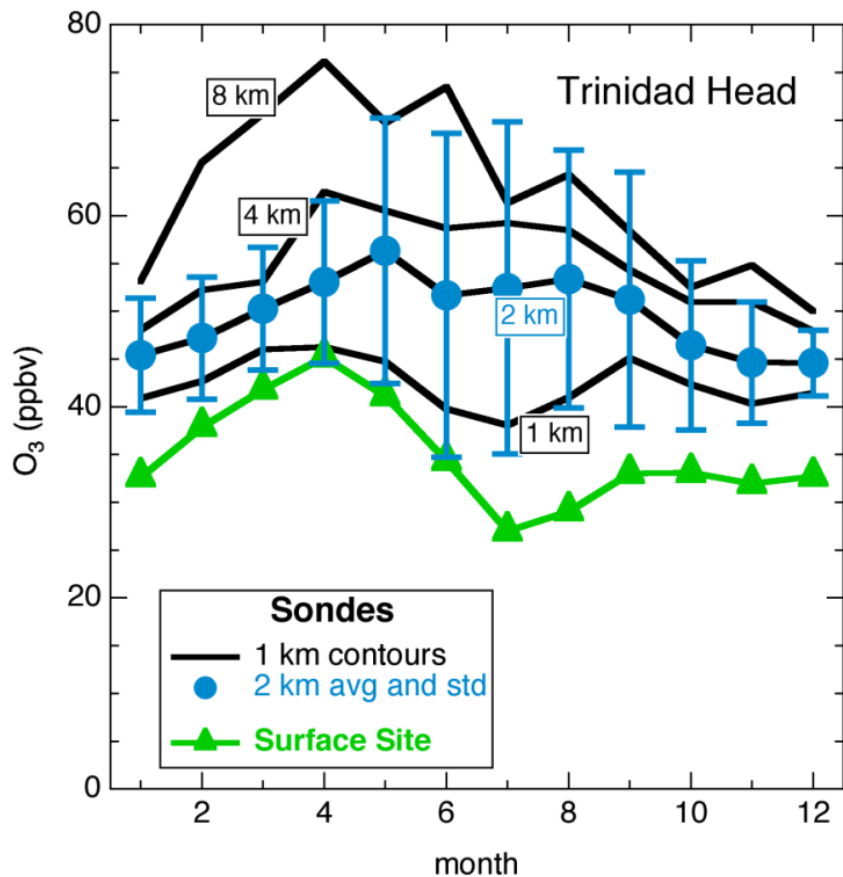


Figure 1. Monthly average O_3 mixing ratios from ESRL Global Monitoring Division measurements at Trinidad Head, CA. Results from the Trinidad Head Baseline Observatory surface site (100 m ASL elevation) are compared with the vertical profiles from the weekly ozonesondes. The 1 km contours from the ozonesondes are 200 m averages about the indicated altitude. The error bars indicate the standard deviations about the averages at 2 km altitude.